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10/655,689

09/05/2003

Yian-Liang Kuo

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EXAMINER

NGUYEN, DILINH P

ART UNIT

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2814

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/655,689	<b>Applicant(s)</b> KUO ET AL.	
	<b>Examiner</b> DiLinh Nguyen	<b>Art Unit</b> 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 May 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 38-52, 55 and 56 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 38-52, 55 and 56 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                      |                                                                   |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____                                                          | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 38 and 49-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shishido et al. (U.S. Pat. 6,294,831) in view of Zhang (U.S. Pub. 2003/0136546).

Shishido et al. disclose an ball grid array package, comprising:

a semiconductor chip/die 14 affixed to a ball grid substrate 12; the ball grid substrate having a series of balls 24; and

a heat spreader mounted to the semiconductor chip/die and the ball grid substrate opposite the series of balls; the heat spreader having a pattern of slots 48, not completely piercing the heat spreader, therein, wherein the slots are arranged in the pattern comprising the pattern selected from the group consisting of: a circular patterns, a radiating patterns, rectangular patterns (cover fig., column 4, lines 53-58).

Shishido et al. do not explicitly disclose the circular pattern is a concentric octagonal pattern.

Zhang discloses a heat sink assembly comprising: a heat sink comprising a plurality of patterns having the patterns selected from the group consisting of a plurality of concentric circular patterns (cover fig., abstract and claim 2). Zhang does not

explicitly disclose an octagonal pattern. However, the change in shape of a component would have been obvious to an ordinary artisan practicing the invention because, absent evidence of disclosure of criticality for the shape giving unexpected results, it is not inventive to discover optimal or workable change in the shape of a component by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). Furthermore, the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising therefrom. Where patentability is aid to be based upon particular chosen shape or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. See *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed, Cir. 1990).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Shishido et al. by having the heat spreader comprising the plurality of concentric circular patterns because as taught by Zhang, such concentric circular patterns would improve heat dissipating efficiency (paragraph 0007).

- Regarding claim 49, Shishido et al. disclose the slots penetrate the heat spreader from about 25 to 85 % (cover fig., fig. 4b or 5b).
- Regarding claim 50, Shishido et al. disclose that the slots penetrate the heat spreader from about 50 to 75% (cover fig., fig. 4b or 5b).

2. Claims 39-40 and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shishido et al. (U.S. Pat. 6294831) in view of Zhang (U.S. Pub.

2003/0136546) as applied to claim 38 above, and further in view of Ho et al. (U.S. Pat. 2002/0079570).

- Regarding claims 39-40, Shishido et al. in view of Zhang substantially discloses all the limitations as claimed above except for the semiconductor chip is a silicon semiconductor chip.

However, Ho et al. disclose a silicon semiconductor chip (paragraph 0006, line 4). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to replace the chip of Shishido et al. in view of Zhang by a silicon semiconductor chip because as taught by Ho et al., such the silicon semiconductor chip is well known in the art for improving the heat dissipating characteristics (paragraph 0006).

- Regarding claims 45-46, Ho et al. disclose that the silicon semiconductor chip has a CTE approximately 3 ppm/°C and the heat spreader has a CTE of 18 ppm/°C (paragraph 0006).

3. Claims 41-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shishido et al. (U.S. Pat. 6294831) in view of Zhang (U.S. Pub. 2003/0136546) as applied to claim 38 above, and further in view of Kubo et al. (U.S. Pat. 6,199,273).

- Regarding claims 41-43, Shishido et al. substantially discloses all the limitations as claimed above. Moreover, Shishido et al. also discloses that the heat spreader 18 is comprised of copper (fig. 1, column 3, lines 35-46).

Shishido et al. in view of Zhang fail to disclose the balls are comprised of 63Sn37Pb, 96.5Sn3.5Ag, 5.5Sn3.8Ag0.7Cu or 96.2Sn2.5Ag0.8Cu0.5Sb.

However, Kubo et al. discloses that a solder ball is comprised of 63Sn37Pb (column 13, lines 36-37). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device of Shishido et al. in view of Zhang by having the balls are comprised of 63Sn37Pb because as taught by Kubo et al, such the 63Sn37Pb solder ball would improve the electric contact characteristic for the semiconductor package (column 13, lines 36-40).

- Regarding claim 44, Kubo et al. disclose that the balls are comprised of 96.5Sn3.5Ag (column 14, lines 28-30).

4. Claims 47-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shishido et al. (U.S. Pat. 6294831) (previously applied) and Zhang (U.S. Pub. 2003/0136546) as applied to claim 38 above, in view of Ho et al. (U.S. Pat. 2002/0079570) and further in view of Jayaraman et al. (U.S. Pat. 6,724,091).

As discussed in details above the combination of Shishido et al., zhang and Ho et al. substantially disclose all the limitations as claimed above except for the chip is a germanium semiconductor chip and has a CTE of from about 5.5 to 6.5 or about 6.1.

However, Jayaraman et al. disclose that the semiconductor chip is a germanium semiconductor chip and has a CTE of about 6 ppm/° (column 1, lines 39-41). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to substitute the chip of the above combination by having a germanium semiconductor chip because as taught by Jayaraman et al., in order to use the semiconductor package in a particular application.

5. Claims 49-52 and 55-56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shishido et al. (U.S. Pat. 6562662) in view of Zhang (U.S. Pub. 2003/0136546) as applied to claim 38 above, and further in view of Dordi (U.S. Pat. 5835355).

- Regarding claim 51, Shishido et al. in view of Zhang do not explicitly disclose the pattern of slots include rows spaced apart from about 1.0 to 5.0 mm; the slots comprising each row are spaced apart from each other from about 0.5 to 2.5 mm.

However, Dordi (fig. 5) discloses a semiconductor package comprising a pattern of slots include rows spaced apart from about 1.0 to 5.0 mm (1.27mm or 5.08 mm, column 6, lines 10-15); the slots comprising each row are spaced apart from each other from about 0.5 to 2.5 mm (0.51mm or 1.27mm, fig. 4, column 6, lines 10-15).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the device structure of Shishido et al. in view of Zhang by having the pattern of slots include rows spaced apart from about 1.0 to 5.0 mm; the slots comprising each row are spaced apart from each other from about 0.5 to 2.5 mm because as taught by Dordi, in order to reduce the amount of moisture from being trapped by the heat spreader and provide good heat dissipation for the semiconductor package (fig. 5, column 3, lines 27-29).

- Regarding claim 49, Dordi discloses that the slots penetrate the heat spreader from about 25 to 85% (fig. 4).
- Regarding claim 50, Dordi discloses that the slots penetrate the heat spreader from about 50 to 75% (fig. 4).

- Regarding claim 52, Dordi discloses that the pattern of slots includes rows spaced apart from about 1.5 to 2.5 mm (fig. 4, column 6, lines 10-15); the slots comprising each row are spaced apart from each other from about 0.7 to 1.5 mm (fig. 4, column 6, lines 10-15).
- Regarding claims 55-56, Dordi discloses that the ball grid array package is a super ball grid array package (fig. 5).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DiLinh Nguyen whose telephone number is (571) 272-1712. The examiner can normally be reached on 8:00AM - 5:00PM (M-F).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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/Hoai v Pham/  
Primary Examiner, Art Unit 2814

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